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北部湾底栖多毛类种类组成与分布

Studies on Assemblages of Benthic Polychaetes in Beibu Gulf

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目录

| | |
|----------------------------|----|
| 摘要..... | 1 |
| Abstract..... | 3 |
| 第一章 前言..... | 1 |
| 1.1 多毛类动物概况 | 1 |
| 1.2 多毛类动物研究历史及现状 | 2 |
| 1.2.1 国际多毛类动物研究历史及现状 | 2 |
| 1.2.2 国内多毛类动物研究历史及现状 | 6 |
| 1.3 多毛类动物与环境的关系与相互影响 | 8 |
| 1.3.1 底质对多毛类动物的影响 | 8 |
| 1.3.2 水质对多毛类动物的影响 | 9 |
| 1.3.3 温度对多毛类动物的影响 | 9 |
| 1.4 北部湾海洋环境概况 | 10 |
| 1.4.1 北部湾海洋生物的研究概述 | 11 |
| 1.4.2 北部湾海底地貌和底质 | 11 |
| 1.4.3 研究海域的温盐及环境特征 | 12 |
| 1.5 研究意义 | 13 |
| 第二章 材料与方法..... | 14 |
| 2.1 站位分布及调查航次 | 14 |
| 2.2 样品及数据处理 | 15 |
| 2.2.1 样品采集和保存 | 15 |
| 2.2.2 实验室分选以及鉴定 | 15 |
| 2.2.3 环境因子的测定方法 | 16 |
| 2.2.4 数据的处理和分析方法 | 16 |
| 2.2.4.1 单变量分析 | 16 |
| 2.2.4.2 分布/图形分析 | 17 |
| 2.2.4.3 多变量分析 | 18 |

| | |
|--|----|
| 第三章 结果 | 20 |
| 3.1 北部湾底栖多毛类种类组成、栖息密度和生物量 | 20 |
| 3.1.1 北部湾底栖多毛类的种类组成 | 20 |
| 3.1.2 北部湾底栖多毛类种类的季节分布 | 21 |
| 3.1.3 北部湾底栖多毛类的栖息密度、生物量及分布特点 | 23 |
| 3.1.4 各季节北部湾底栖多毛类优势种类分布 | 25 |
| 3.2 北部湾底栖多毛类的种类分布特征 | 29 |
| 3.2.1 春季航次北部湾底栖多毛类的种类分布特征 | 29 |
| 3.2.1.1 春季航次多毛类高贡献率种类 | 29 |
| 3.2.1.2 春季航次多毛类组群聚类分析 | 30 |
| 3.2.1.3 春季航次多毛类各组群分布 | 30 |
| 3.2.1.4 春季航次多毛类各组群多样性分析 | 32 |
| 3.2.1.5 春季航次多毛类与环境因子的关系 | 33 |
| 3.2.1.5.1 春季航次环境因子的主成份分析 (PCA 分析) | 33 |
| 3.2.1.5.2 春季航次多毛类与环境因子的典型对应分析 (CCA 分析) | 35 |
| 3.2.2 夏季航次北部湾底栖多毛类的组成结构特征 | 35 |
| 3.2.2.1 夏季航次多毛类高贡献率种类 | 35 |
| 3.2.2.2 夏季航次多毛类组群聚类分析 | 37 |
| 3.2.2.3 夏季航次多毛类各组群分布 | 37 |
| 3.2.2.4 夏季航次多毛类各组群多样性分析 | 38 |
| 3.2.2.5 夏季航次多毛类与环境因子的关系 | 40 |
| 3.2.2.5.1 夏季航次环境因子的主成份分析 (PCA 分析) | 40 |
| 3.2.2.5.2 夏季航次多毛类与环境因子的典型对应分析 (CCA 分析) | 41 |
| 3.2.3 秋季航次北部湾底栖多毛类的组成结构特征 | 42 |
| 3.2.3.1 秋季航次多毛类高贡献率种类 | 42 |
| 3.2.3.2 秋季航次多毛类组群聚类分析 | 43 |
| 3.2.3.3 秋季航次多毛类各组群分布 | 44 |

| | |
|--|----|
| 3.2.3.4 秋季航次多毛类各组群多样性分析 | 45 |
| 3.2.3.5 秋季航次多毛类与环境因子的关系 | 47 |
| 3.2.3.5.1 秋季航次环境因子的主成份分析 (PCA 分析) | 47 |
| 3.2.3.5.2 秋季航次多毛类与环境因子的典型对应分析 (CCA 分析) | 48 |
| 3.2.4 冬季航次北部湾底栖多毛类的组成结构特征 | 49 |
| 3.2.4.1 冬季航次多毛类高贡献率种类 | 49 |
| 3.2.4.2 冬季航次多毛类组群聚类分析 | 50 |
| 3.2.4.3 冬季航次多毛类各组群分布 | 51 |
| 3.2.4.4 冬季航次多毛类各组群多样性分析 | 52 |
| 3.2.4.5 冬季航次多毛类与环境因子的关系 | 54 |
| 3.2.4.5.1 冬季航次环境因子的主成份分析 (PCA 分析) | 54 |
| 3.2.4.5.2 冬季航次多毛类与环境因子的典型对应分析 (CCA 分析) | 55 |
| 第四章 讨论 | 57 |
| 4.1 与国内海区历史资料比较 | 57 |
| 4.1.1 与相同海区历史资料比较 | 57 |
| 4.1.2 与国内其它海区历史资料比较 | 59 |
| 4.2 与全球海域历史资料比较 | 63 |
| 4.3 多毛类动物栖息密度与环境因子关系的探讨 | 64 |
| 4.3.1 水深和沉积物性质对多毛类栖息密度的影响 | 64 |
| 4.3.2 水质和底质营养盐对多毛类栖息密度的影响 | 67 |
| 第五章 论文小结 | 69 |
| 5.1 研究成果 | 69 |
| 5.2 创新点 | 71 |
| 5.3 不足之处 | 71 |
| 5.4 展望 | 72 |
| 参考文献 | 73 |

| | |
|----------|----|
| 附录 | 83 |
|----------|----|

| | |
|----------|----|
| 致谢 | 95 |
|----------|----|

厦门大学博士论文摘要库

Content

| | |
|--|----|
| Abstract(in Chinese) | 1 |
| Abstract(in English) | 3 |
| Chapter 1 Preface | 1 |
| 1.1 Polychaeta introduction | 1 |
| 1.2 Histroy and developing research on polychaetes | 2 |
| 1.2.1 Histroy and research progress on polychaetes international..... | 2 |
| 1.2.2 Histroy and research progress on polychaetes in China..... | 6 |
| 1.3 Relationship and effection between polychaetes and environment factors ...8 | |
| 1.3.1 The effection from substratum to polychaetes..... | 8 |
| 1.3.2 The effection from sea water to polychaetes..... | 9 |
| 1.3.3 The effection from temperature to polychaetes..... | 9 |
| 1.4 Beibu Gulf Environment introduction | 10 |
| 1.4.1 Research progress of marine biology in Beibu Gulf..... | 10 |
| 1.4.2 The bottom sea geography situation of Beibu Gulf..... | 11 |
| 1.4.3 Temperature、salinity and environment traits in Beibu Gulf..... | 12 |
| 1.5 Significance of this study | 13 |
| Chapter 2 Research area and menthod | 14 |
| 2.1 Distribution of the sampling stations | 14 |
| 2.2 Research methods of polychaeta | 15 |
| 2.2.1 Samples collection and dealing..... | 15 |
| 2.2.2 Classification and identification..... | 15 |
| 2.2.3 Mensuration of environment factors in research area..... | 15 |
| 2.2.4 Data Statistic..... | 16 |
| 2.2.4.1 univariate analysis..... | 16 |
| 2.2.4.2 Graph analysis..... | 17 |
| 2.2.4.3 multi-variable analysis..... | 18 |

| | |
|--|----|
| Chapter 3 Result | 20 |
| 3.1 The species、biomass and density distribution of polychaetes in Beibu Gulf | 20 |
| 3.1.1 The species distribution of polychaetes in Beibu Gulf..... | 20 |
| 3.1.2 The species seasonal change of polychaetes in Beibu Gulf..... | 21 |
| 3.1.3 The biomass and density distribution of polychaetes in Beibu Gulf..... | 23 |
| 3.1.4 The dominant species distribution of polychaetes in Beibu Gulf..... | 25 |
| 3.2 The assemblages traits of polychaetes in Beibu Gulf | 29 |
| 3.2.1 The assemblages traits of polychaetes in spring in Beibu Gulf..... | 29 |
| 3.2.1.1 The most contributive species in spring..... | 29 |
| 3.2.1.2 Cluster analysis of polychaetes in spring..... | 30 |
| 3.2.1.3 Distribution of polychaetes assemblages in spring..... | 30 |
| 3.2.1.4 Species diversity analysis of polychaetes in spring..... | 32 |
| 3.2.1.5 Relationships between polychaetes and environmental factors...33 | |
| 3.2.1.5.1 PCA analysis of environmental factors in spring..... | 33 |
| 3.2.1.5.2 CCA analysis of most contributive polychaetes species and environmental factors in spring..... | 35 |
| 3.2.2 The assemblages traits of polychaetes in summer in Beibu Gulf..... | 35 |
| 3.2.2.1 The most contributive species in summer..... | 35 |
| 3.2.2.2 Cluster analysis of polychaetes in summer..... | 37 |
| 3.2.2.3 Distribution of polychaetes assemblages in summer..... | 37 |
| 3.2.2.4 Species diversity analysis of polychaetes in summer..... | 38 |
| 3.2.2.5 Relationships between polychaetes and environmental factors in summer..... | 40 |
| 3.2.2.5.1 PCA analysis of environmental factors in summer..... | 40 |
| 3.2.2.5.2 CCA analysis of most contributive polychaetes species and environmental factors in summer..... | 41 |
| 3.2.3 The assemblages traits of polychaetes in autumn in Beibu Gulf..... | 42 |
| 3.2.3.1 The most contributive species in autumn..... | 42 |

| | |
|--|-----------|
| 3.2.3.2 Cluster analysis of polychaetes in autumn..... | 43 |
| 3.2.3.3 Distribution of polychaetes assemblages in autumn..... | 44 |
| 3.2.3.4 Species diversity analysis of polychaetes in autumn..... | 45 |
| 3.2.3.5 Relationships between polychaetes and environmental factors in autumn..... | 47 |
| 3.2.3.5.1 PCA analysis of environmental factors in autumn..... | 47 |
| 3.2.3.5.2 CCA analysis of most contributive polychaetes species and environmental factors in autumn..... | 48 |
| 3.2.4 The assemblages traits of polychaetes in winter in Beibu Gulf..... | 49 |
| 3.2.4.1 The most contributive species in winter..... | 49 |
| 3.2.4.2 Cluster analysis of polychaetes in winter..... | 50 |
| 3.2.4.3 Distribution of polychaetes assemblages in winter..... | 51 |
| 3.2.4.4 Species diversity analysis of polychaetes in winter..... | 52 |
| 3.2.4.5 Relationships between polychaetes and environmental factors in winter..... | 54 |
| 3.2.4.5.1 PCA analysis of environmental factors in winter..... | 54 |
| 3.2.4.5.2 CCA analysis of most contributive polychaetes species and environmental factors in winter..... | 55 |
| Chapter 4 Discussion..... | 57 |
| 4.1 Comparison of polychaetes distribution of historical datas in china..... | 57 |
| 4.1.1 Comparison of polychaetes distribution of historical data from the same sampling area..... | 57 |
| 4.1.2 Comparison of polychaetes distribution of historical data from the different sampling area in china..... | 59 |
| 4.2 Comparison of polychaetes distribution of historical datas from world wide..... | 63 |
| 4.3 The relationship between polychaetes density and environmental factors...64 | |
| 4.3.1 The relationship between polychaetes density and depth 、 sedimental character..... | 64 |

| | |
|---|-----------|
| 4.3.2 The relationship between polychaetes density and water quality、TP、TN..... | 67 |
| Chapter 5 Summary..... | 69 |
| 5.1 Study results..... | 69 |
| 5.2 Innovation..... | 71 |
| 5.3 Insufficiency..... | 71 |
| 5.4 Prospection..... | 72 |
| Reference..... | 73 |
| Appendix..... | 83 |
| Acknowledgment..... | 95 |

摘要

海洋底栖多毛纲动物是底栖生态系统的重要组成部分,也在底栖生态系统物质循环、能量流动中起着消费者的作用,同时许多种类都可以作为海洋沉积环境质量评价的指示生物。多毛类动物作为海洋底栖群落中种类数量和栖息密度常居首位的类群,研究它们的种类组成、栖息密度和生物量分布、季节差异,探讨它们与环境因子的相互关系,不仅可以了解特定海域底栖多毛类的物种分布,还可以为环境监测提供生态学依据,为保护和开发海洋底栖生态系统提供理论支持。

本文依托我国近海海洋综合调查与评价专项(908 专项),选取北部湾中国所属海域为研究地点,设置 76 个站位,针对底栖生物中的多毛类动物,重点研究其种类组成、栖息密度和生物量分布、季节差异,并结合理化因子采用单变量和多变量的方法研究了北部湾底栖多毛类的多样性特征,通过与历史资料比较探讨了北部湾底栖多毛类在种类、栖息密度和生物量上的变化趋势。主要研究结果如下:

1. 共鉴定出北部湾海域底栖多毛类 308 种,其中鉴定到种的有 175 种,鉴定到属的有 112 种,鉴定到科的有 21 种。所鉴定多毛类隶属于 45 个科,152 个属,其中以广西沿岸站位、白龙尾岛附近站位以及海南岛三亚西南海域的站位多毛类种类较为丰富。种类数上春季为 171 种、夏季为 207 种、秋季为 135 种、冬季为 180 种。春季的优势种类为双鳃内卷齿蚕(*Aglaophamus dibranchis*)、背蚓虫(*Notomastus latericeus*)、栉状长手沙蚕(*Magelona crenulifrons*)、丝鳃稚齿虫(*Prionospio malmgreni*)和拟特须虫(*Paralacydonia paradoxa*) 5 种,夏季的优势种类为栉状长手沙蚕和梳鳃虫(*Terebellides stroemii*) 2 种,秋季优势种类为双鳃内卷齿蚕 1 种,冬季优势种类为双鳃内卷齿蚕、栉状长手沙蚕、独毛虫(*Aglaophamus* sp.)和索沙蚕(*Lumbrineris* sp.) 4 种。

2. 北部湾底栖多毛类平均栖息密度为 193.41 个/m²,平均生物量为 2.62g/m²。栖息密度夏季最高,其次为春季和冬季,秋季最低;生物量则冬季最高,夏季和春季次之,同样秋季最低。

3. 春、夏、秋、冬四个航次的多毛类动物分别利用它们站位之间的平均相似率,进行组群聚类,结果表明四个航次都可以将多毛类动物大致分为三个组群,

分别为位于北部湾北部海域的组群,位于海南岛西侧的组群以及位于海南岛南侧的组群。

4.利用主成份分析(PCA 分析)探讨了各季节环境因子与底栖多毛类栖息密度的相关性,其中春季环境因子中的沉积物性质、溶解氧、盐度、水深与多毛类栖息密度相关性较强,夏季和秋季环境因子中的沉积物性质、溶解氧、盐度、水深、PH 值与多毛类栖息密度相关性较强,冬季环境因子中的底温、沉积物类型以及溶解氧含量与多毛类栖息密度相关性较强。利用典型对应分析(CCA 分析)研究了高贡献率种类在不同季节对不同环境因子的适应性。

5.通过与相同海域以及全球范围内的不同海域的历史资料比较,分析了北部湾底栖多毛类种类组成、栖息密度、生物量和种类分布特征的相似性和独特性。

关键词: 底栖动物; 多毛类; 生物多样性; 生物量; 北部湾

Abstract

Polychaetes is an important component of the benthic ecosystem as well as a positive consumer of material cycling and energy flowing. Many species work as bio-indicators to appraise the quality of sediment. Polychaeta as the largest species number and density group among benthic animals, the study of which species composing, biomass change, seasonal difference and the relationship with environmental factors is very significant. It can not only light the particular of a specific research area, also provide a benthic ecological basis for marine environment restoration, protection and exploitation.

Base on the National Inshore Research and Appraisal Project (908 Project), we choosed Beibu Gulf as the research area, focus on the polychaeta from benthic animals, and analyzed species composing, biomass change, seasonal difference of polychaeta, different univariate and multi-variable analysis were used to study the community traits of polychaeta from Beibu Gulf. Compared with the history data and the change of species number and biomass of polychaeta were found. The main results are as follows:

1. Total 308 species of benthic polychaeta were identified in the four seasons in Beibu Gulf, they belonged to 45 families and 152 genus. The three most populated areas are the coast of Guangxi province, the area near Bailongwei island and the south area of Hainan island. The species number of polychaeta was 171 in spring, 207 in summer, 135 in autumn and 180 in winter. The dominant species are *Aglaophamus dibranchis*, *Notomastus latericeus*, *Magelona crenulifrons*, *Prionospio malmgreni*, *Paralacydonia paradoxa* in spring, *Magelona crenulifrons* and *Terebellides stroemii* in summer, *Aglaophamus dibranchis* in autumn, *Aglaophamus dibranchis*, *Magelona crenulifrons*, *Aglaophamus* sp. and *Lumbrineris* sp.in winter.

2. The benthic polychaeta mean density is 193.41 ind/m², mean biomass is 2.62g/m². In summer,the polychaeta mean density is the highest, spring and winter are average, and it's the lowest in autumn. In winter, the polychaeta mean biomass is the

highest, summer and spring are average , and it's the lowest in autumn

3. Used the mean similarity of benthic polychaeta from each season from each research station, cluster analysis was done and the result showed there were three main communities of benthic polychaeta in Beibu Gulf. One located in the north of Beibu Gulf, the second one located in the west of Hainan island and the third one located in the south of Hainan island.

4. Used the PCA analysis, it showed that the different environmental factors in each season had certain relativity with polychaeta density. Used the CCA analysis, it showed the different environmental factors in each season had certain relativity with certain polychaeta species.

5. Comparing with the history data from the same and world wide research area, it shows that the polychaeta species composition, density and seasonal change was quite different in Beibu Gulf.

Keywords: Benthos; polychaetes; Biodiversity; Biomass; Beibu Gulf

第一章 前言

多毛纲动物隶属环节动物门，约有 80 科，1000 属，现已有准确描述的种类达 8500 多种^[1]，是环节动物最大的纲，它们体型大都呈蠕虫状，身体同律分节，体节上具有单叶或者双叶型疣足，疣足上又具有形态各异的刚毛，故得名多毛类动物。多毛类在淡水和海洋中均有分布，海洋的种类占全部种类的 98% 以上^[2]，几乎在所有的海洋栖息环境中都有发现，从潮间带、浅海到深海，一些多毛类动物甚至主导着热液口生态系统^[3]。多毛类动物作为海洋底栖群落中种类数量和栖息密度常居首位的类群^[4]，研究它们的种类组成、栖息密度和生物量变化、季节差异，探讨它们与环境因子的相互关系，不仅可以了解特定海域多毛类动物的物种分布，还可以为环境监测提供生态学依据，为保护海洋底栖生态系统提供理论支持。

1.1 多毛类动物概况

多毛类是一群古老的生物，根据化石记录显示，最原始的多毛类可追溯至 5 亿年前^[5]。多毛类动物的同律分节、三胚层、两侧对称、裂生体腔等特征^[6]使得它们成为无脊椎动物的代表类群之一，同时它们的众多独特性也在动物学基础理论研究上有着重要的科学意义。

除少数种类营浮游生活外，大部分多毛类动物栖息在海洋岩石下、海洋沉积物中或者营管栖、穴居生活。不同的栖息方式，使得多毛类动物在形态、生态、生理方面都呈现出丰富的多样性，成体多毛类动物小至几毫米大到五六米均有发现，而在热液口附近发现的矾沙蚕科（Eunicidae）动物有很多体长超过了三米^[7]，营底爬生活的种类常拥有发达的眼和用于挖掘的附肢，营管栖生活的头部常退化。

多毛类动物生殖的多样化，在动物界颇有代表性。裂虫科（Syllisidae）动物的主要行出芽生殖和断裂生殖等无性生殖，而大多数种类行异体受精的有性生殖，经过特殊的担轮幼虫、后担轮幼虫等浮游幼体阶段，有利于多毛类动物的广泛分布。

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